Skobeltsyn Institute of Nuclear Physics

Lomonosov Moscow State University

Space Physics Researches at SINP

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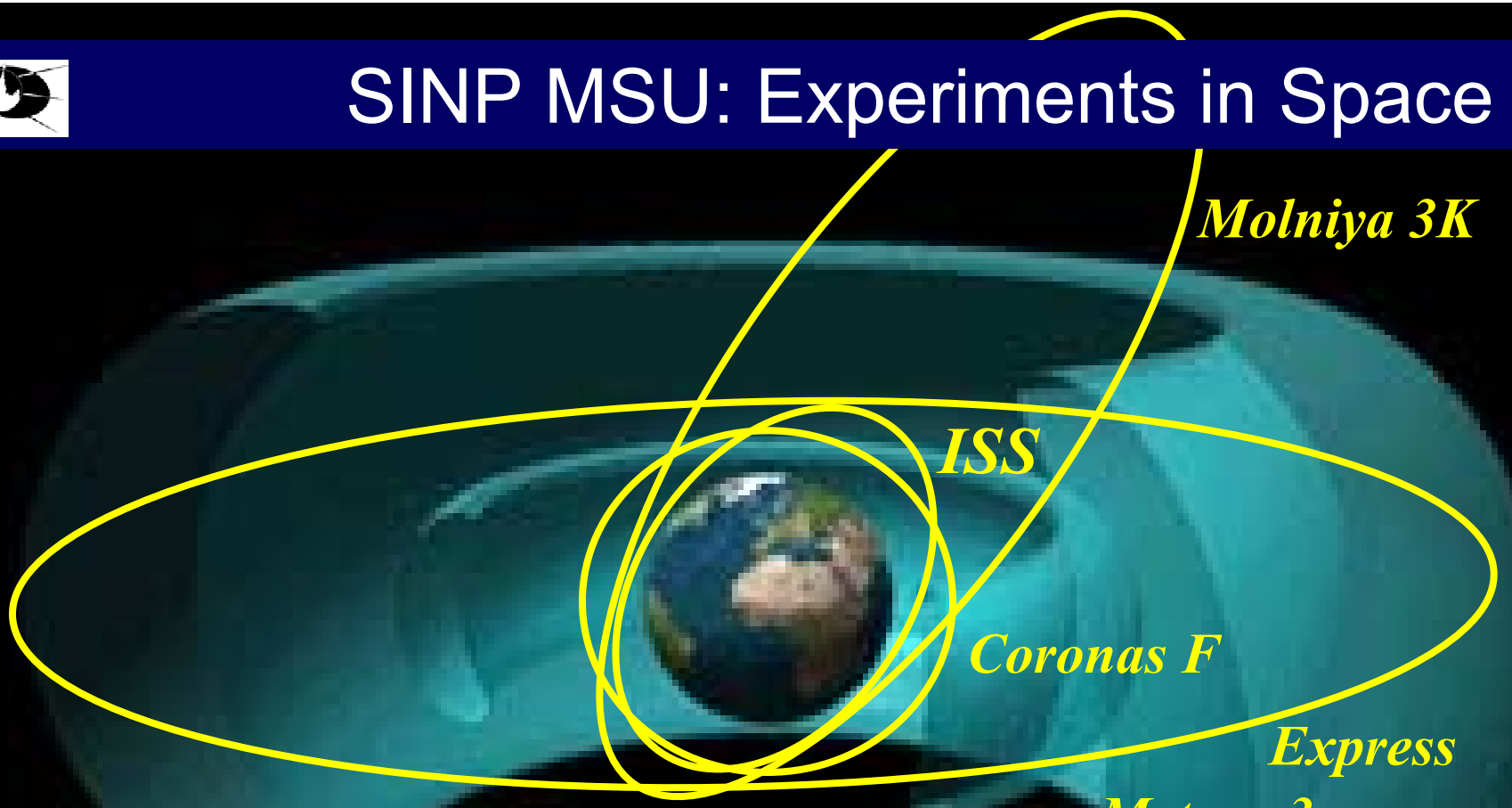
The main activities in space physics:

- Space radiation detectors and other instrumentation to be used in space;
- Development of empirical models of radiation in space; radiation environment monitoring;
- Development of large-scale magnetospheric models;
- Scientific data on Sun/Earth interaction management.

SINP MSU: Experiments in Space



Measurements of:

- hot plasma,
- medium and high energy electrons, protons & doses.

SINP/MSU experiments on ISS

SINP/MSU experiments on International Space Station.

Dosimetry:

R-16, SRC, Scorpion

Radiation environment monitoring

- The cosmic ray anomalous component particles trapping in the Earth's magnetosphere
- The impact of space radiation and other space environment factors on spacecraft systems and materials
- Development of empirical models of radiation in space

ISO/DIS No 15390 "Space environment (natural and artificial). Model of radiation impact by galactic cosmic rays"

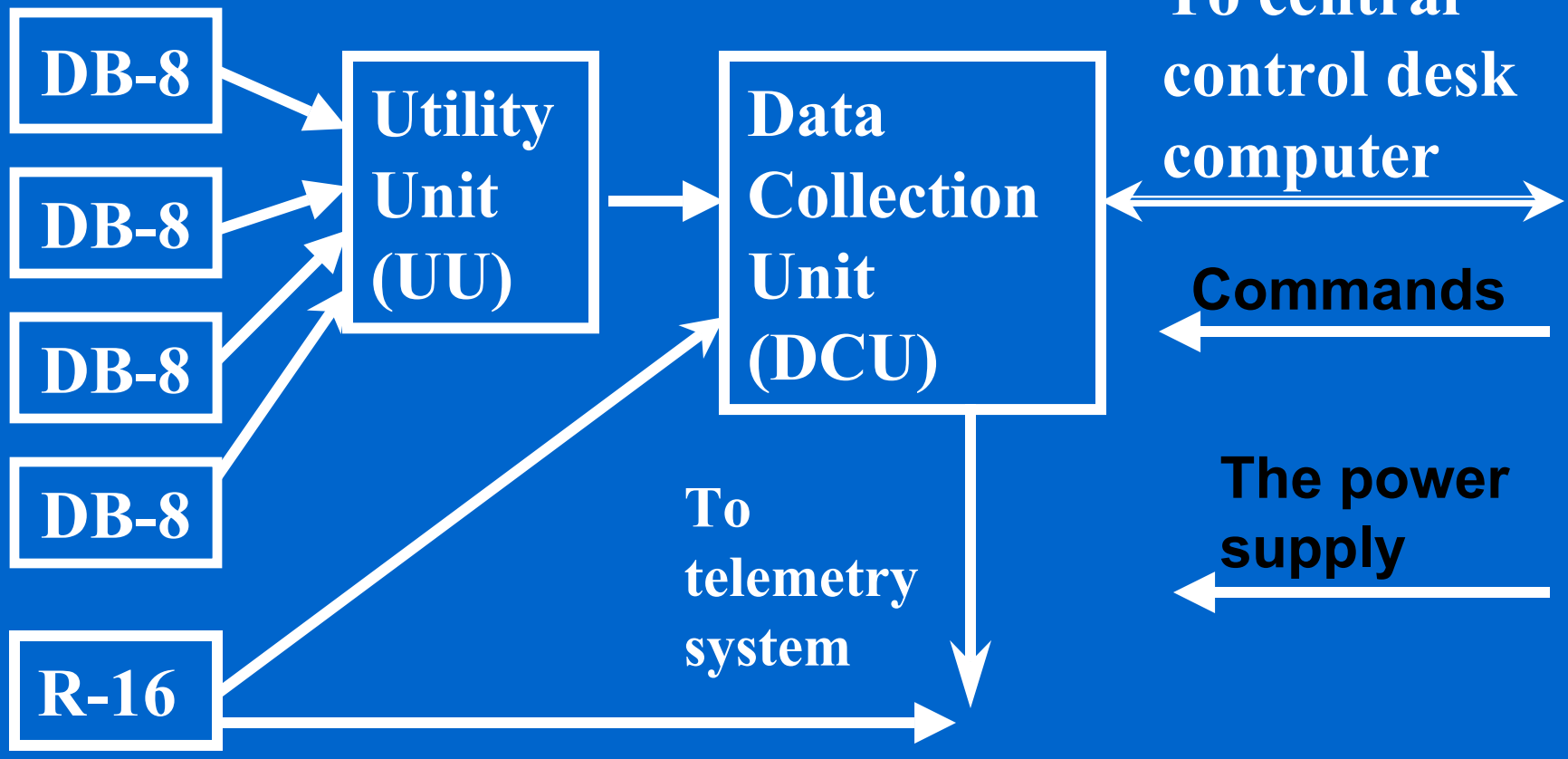
The Radiation Monitoring System of the Russian Segment of the ISS. Current Status and Results.

1) S.P.Korolev Rocket and Space Corporation «Energia»

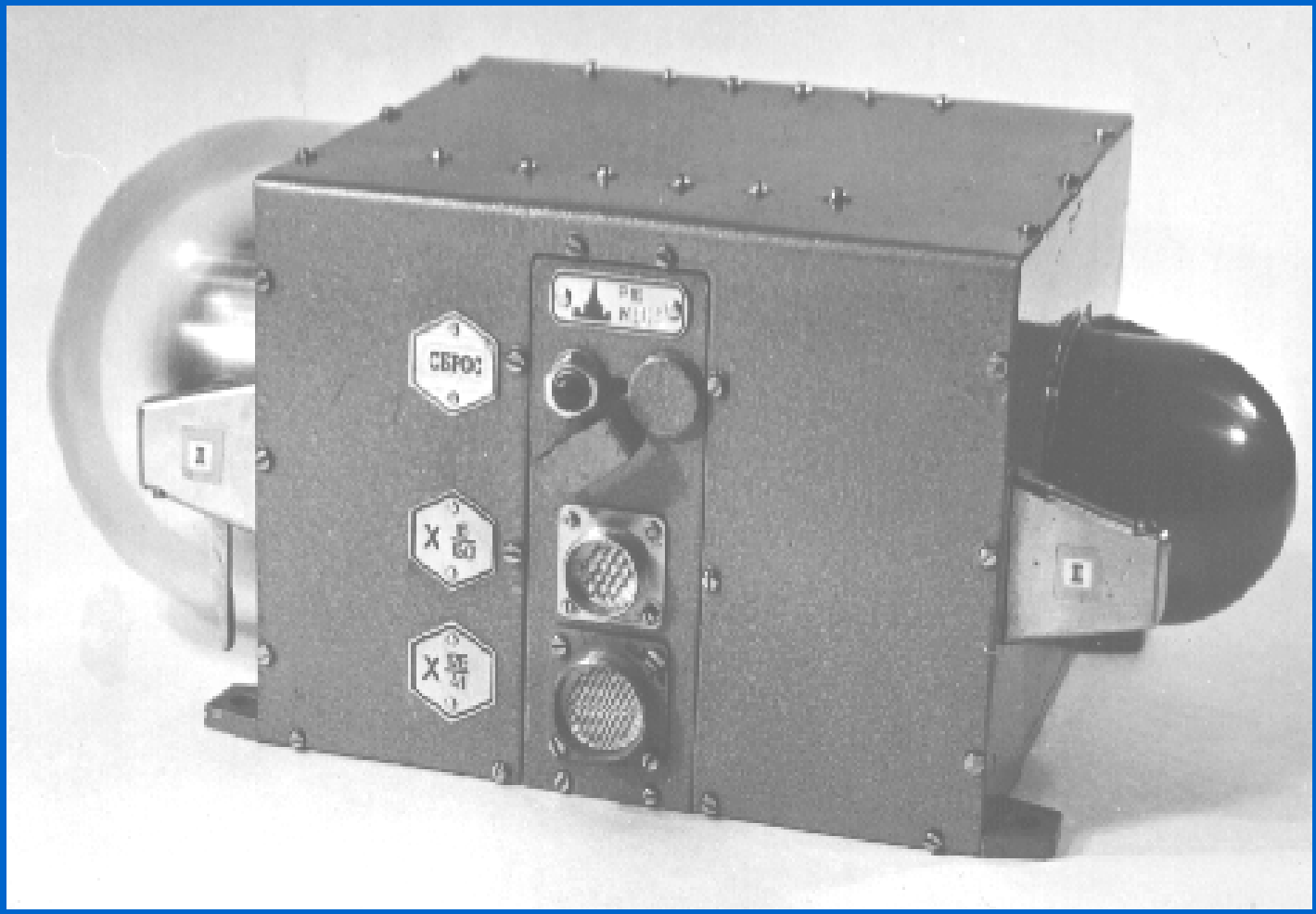
2) Skobeltsyn Institute of Nuclear Physics of Moscow State University

3) State Research Centre RF – Institute for Biomedical Problems, Russian Academy of Sciences

Current configuration of the radiation monitoring system (RMS)



R-16 dosimeter



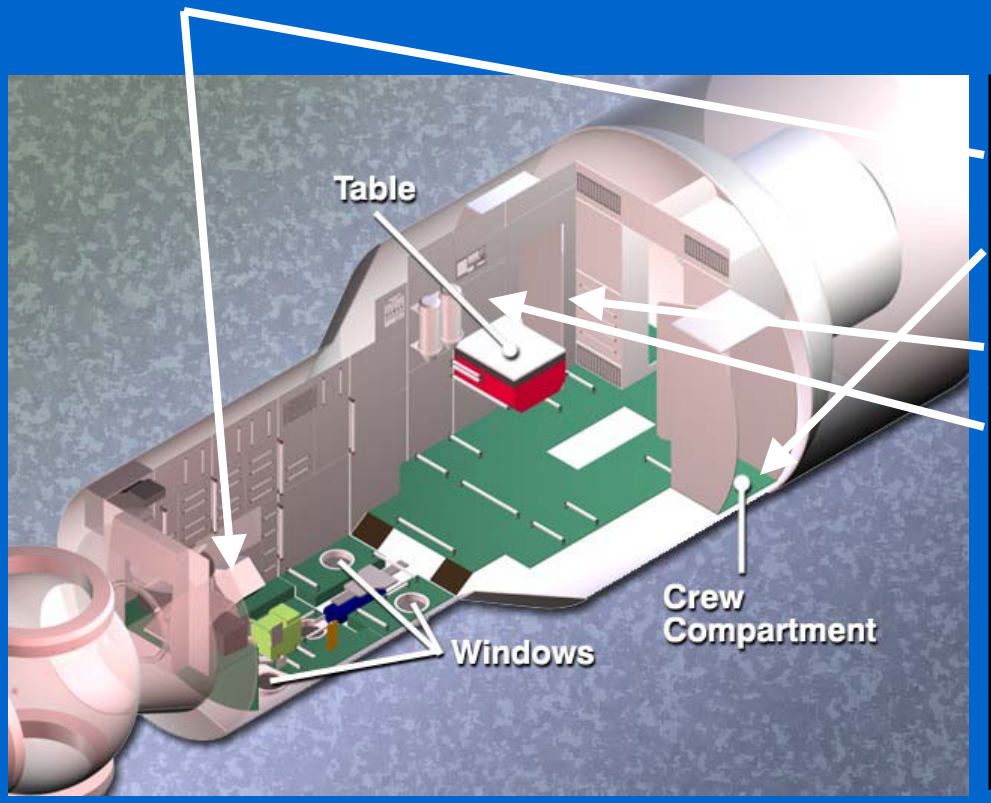
DB-8 unit

The Russian segment of the ISS

The R-16 device has been operating on the ISS since summer, 2000.
Four DB-8 sets, Utility Unit and Data Collection Unit, were delivered to the ISS by "Progress M 1-6" on May 23, 2001.
On the 27th of July, 2001 the crew of the 2nd ISS mission mounted the blocks on board of the Service Module and connected up the cables.

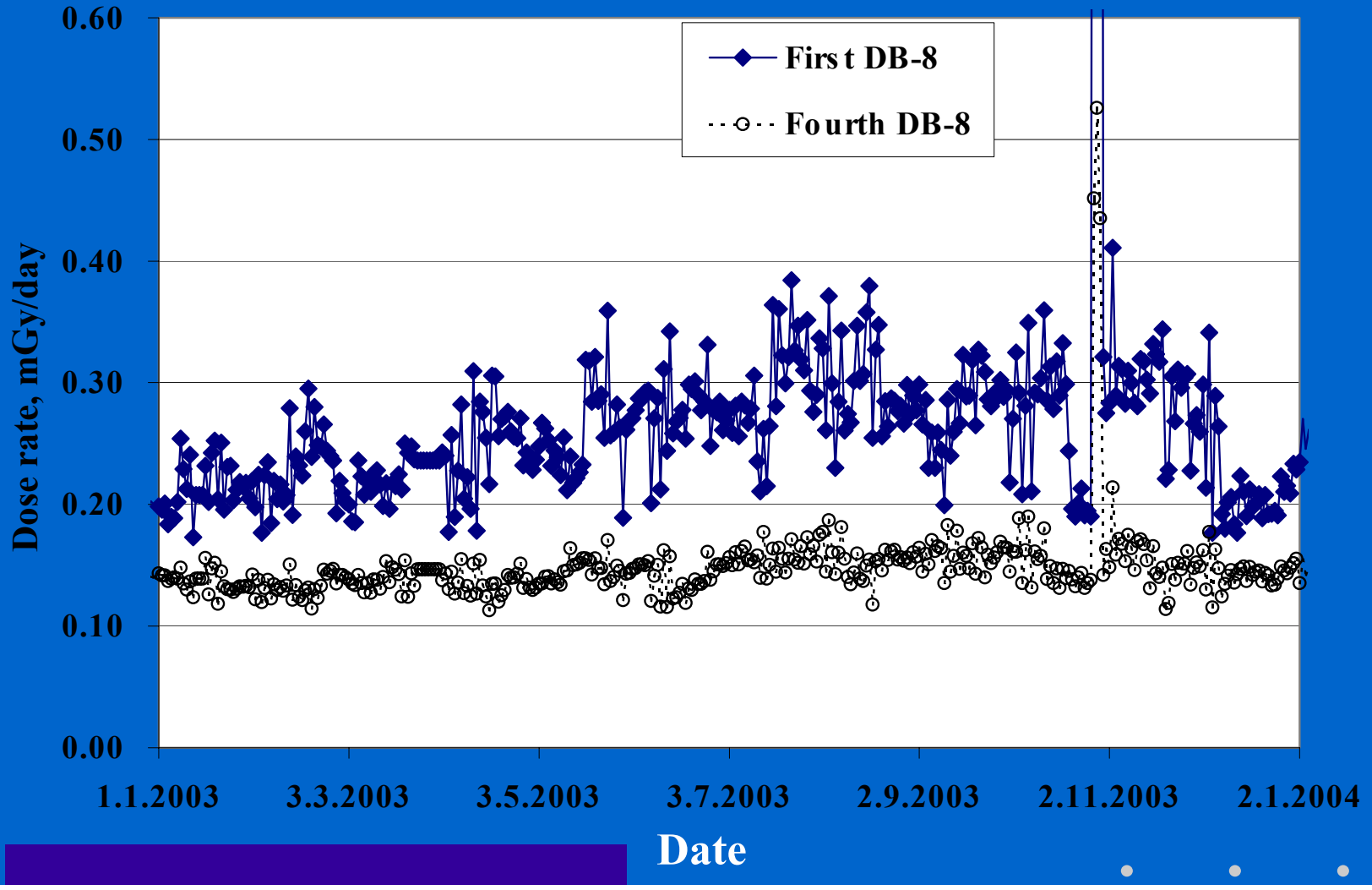
The RMS has been operating since August 1, 2001 12:42 UT.

Placements of the RMS blocks



Block	Placement
DB-8 №1	Starboard side, behind board № 410
DB-8 №2	Port side, behind board № 244 (cabin)
DB-8 №3	Starboard side, behind board № 447 (cabin)
DB-8 №4	Starboard side, behind board № 435
R-16	Ceiling of Big diameter bay, behind board № 327
UU	Starboard side, behind board № 447 (cabin)
DCU	starboard side, behind board № 447 (cabin)

Daily doses measured with unshielded detectors of the first and fourth DB-8 units since January 1 till December 31, 2003



CORONAS-F satellite

- was launched on July 30th, 2001
- circular orbit with altitude ~ 500 km
- inclination ~ 83°
- scientific information available from August 14th, 2001 to present.

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MONITORING of COSMIC RAYS

We present here data obtained by two detector types in the following energy ranges –

1.) semiconductor telescope

- **electrons 300 - 600 keV**
- **electrons 1.5 - 3 MeV**
- **electrons 3 - 6 MeV**
- **protons 1 - 5 MeV**

2.) scintillator

- **protons 14-26 MeV**

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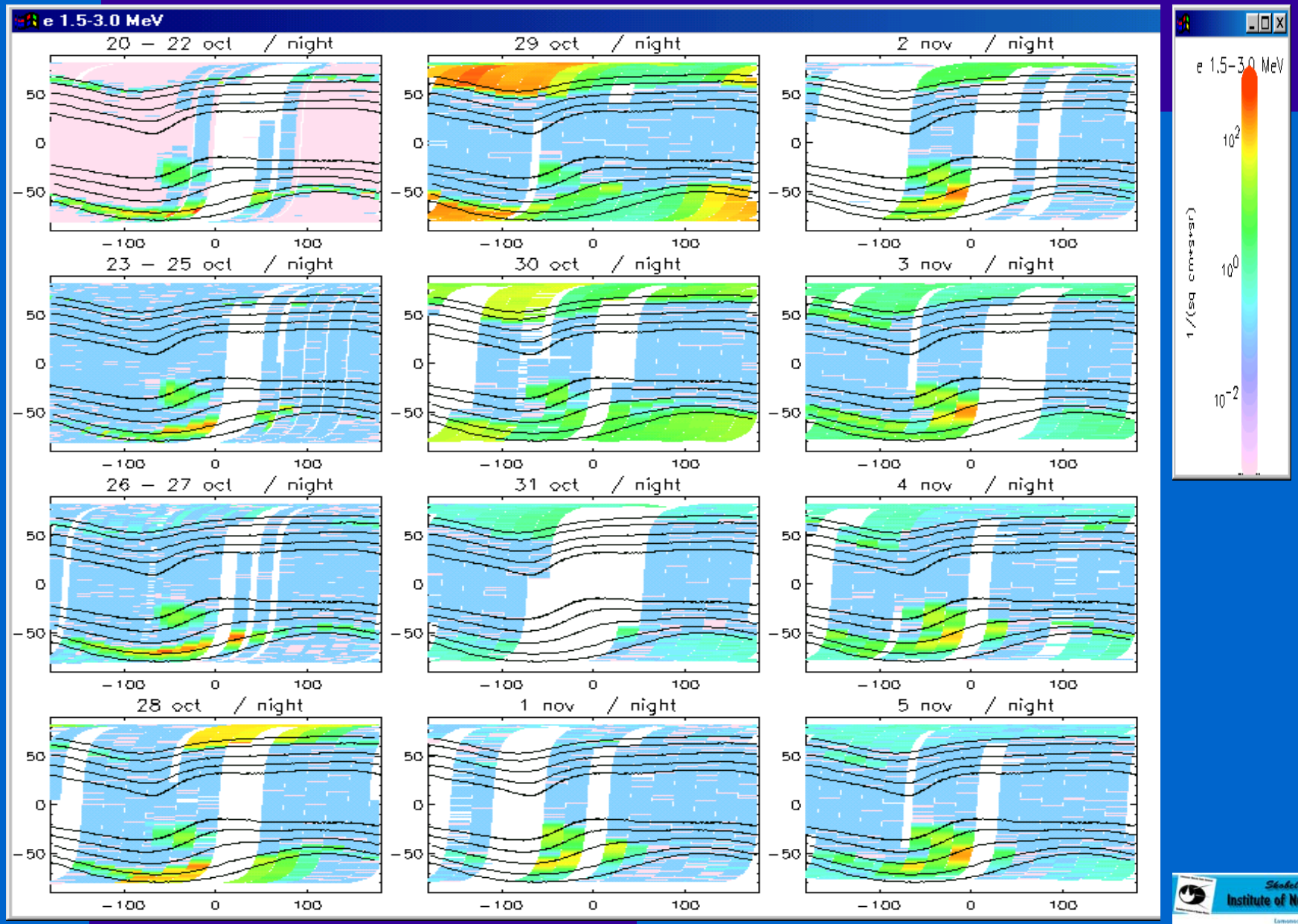
Electrons 1.5-3 MeV , night local time (L= 1.3, 1.6, 2.2, 3.5, 5.5)



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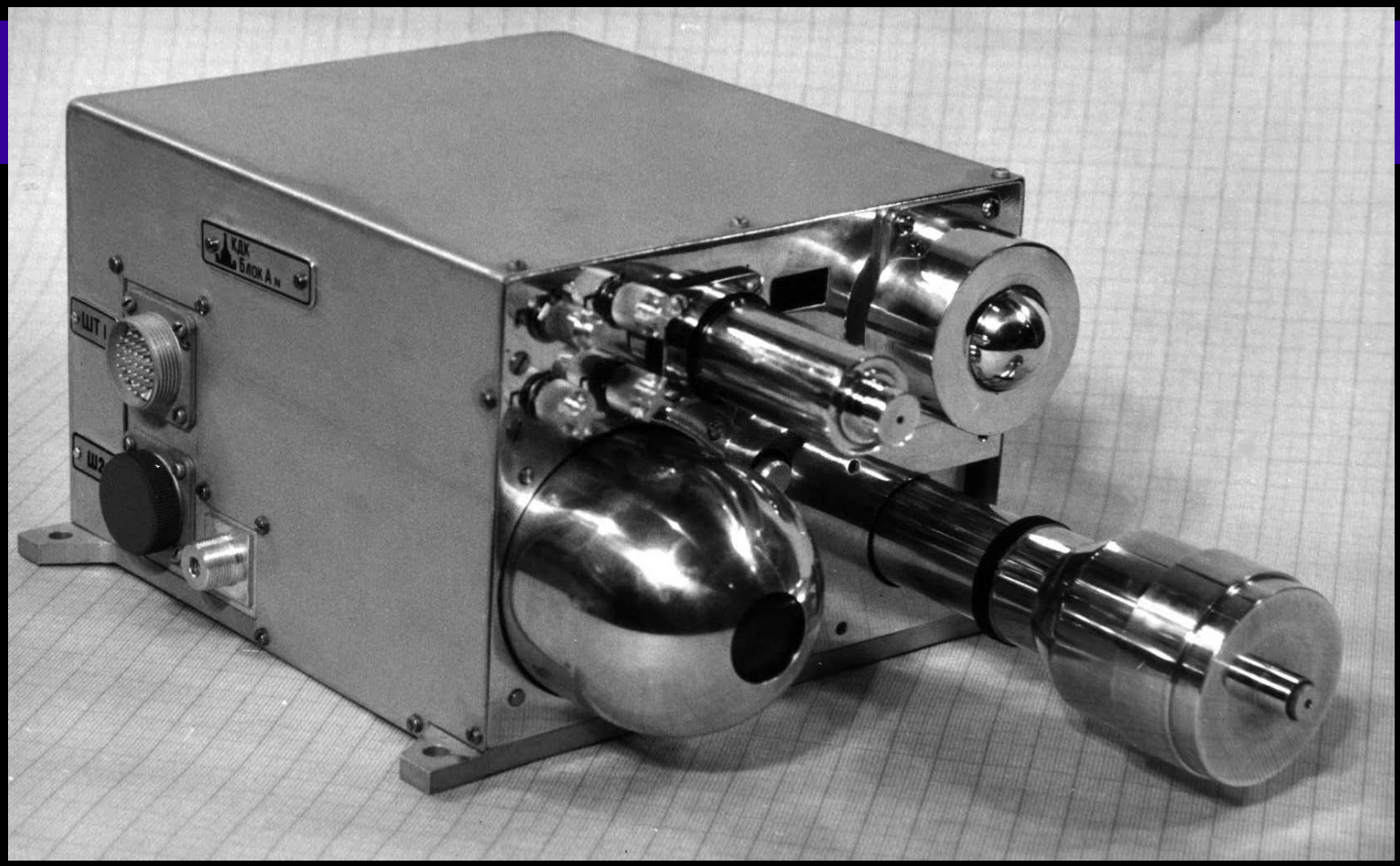
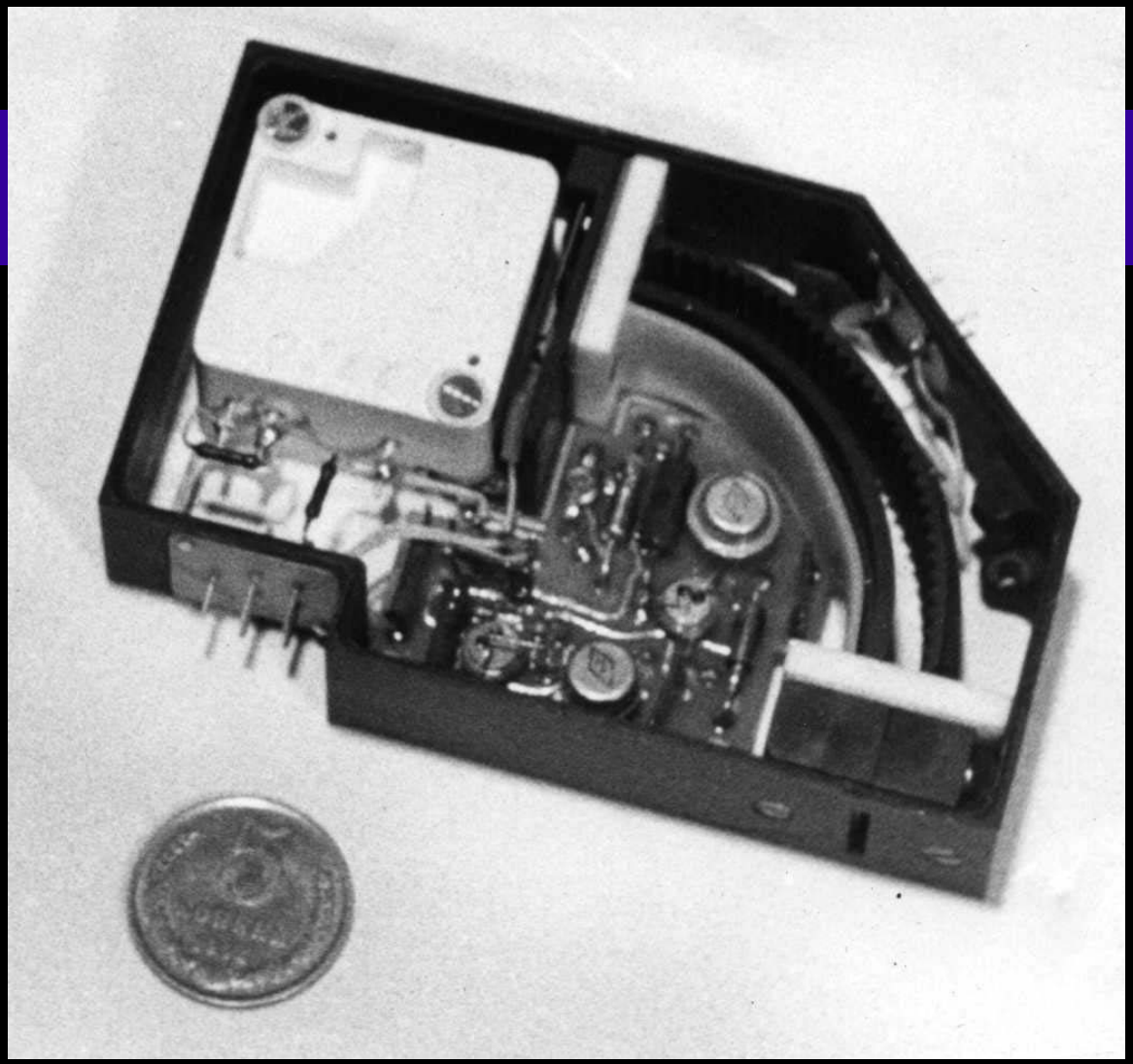
Radiation Measurements onboard Geostationary Satellites

Monitoring Service Aims

1. Estimation of Space Environment Radiation Impact on Satellites;
2. Examination of Existing Models and Creation New Models of Radiation Fields;
3. Collection of Experimental Date to Solve the Problems of the Earht's Magnetosphere Physics



DIERA



Electrostatic Analyzer

Detectors and Measured Parameters

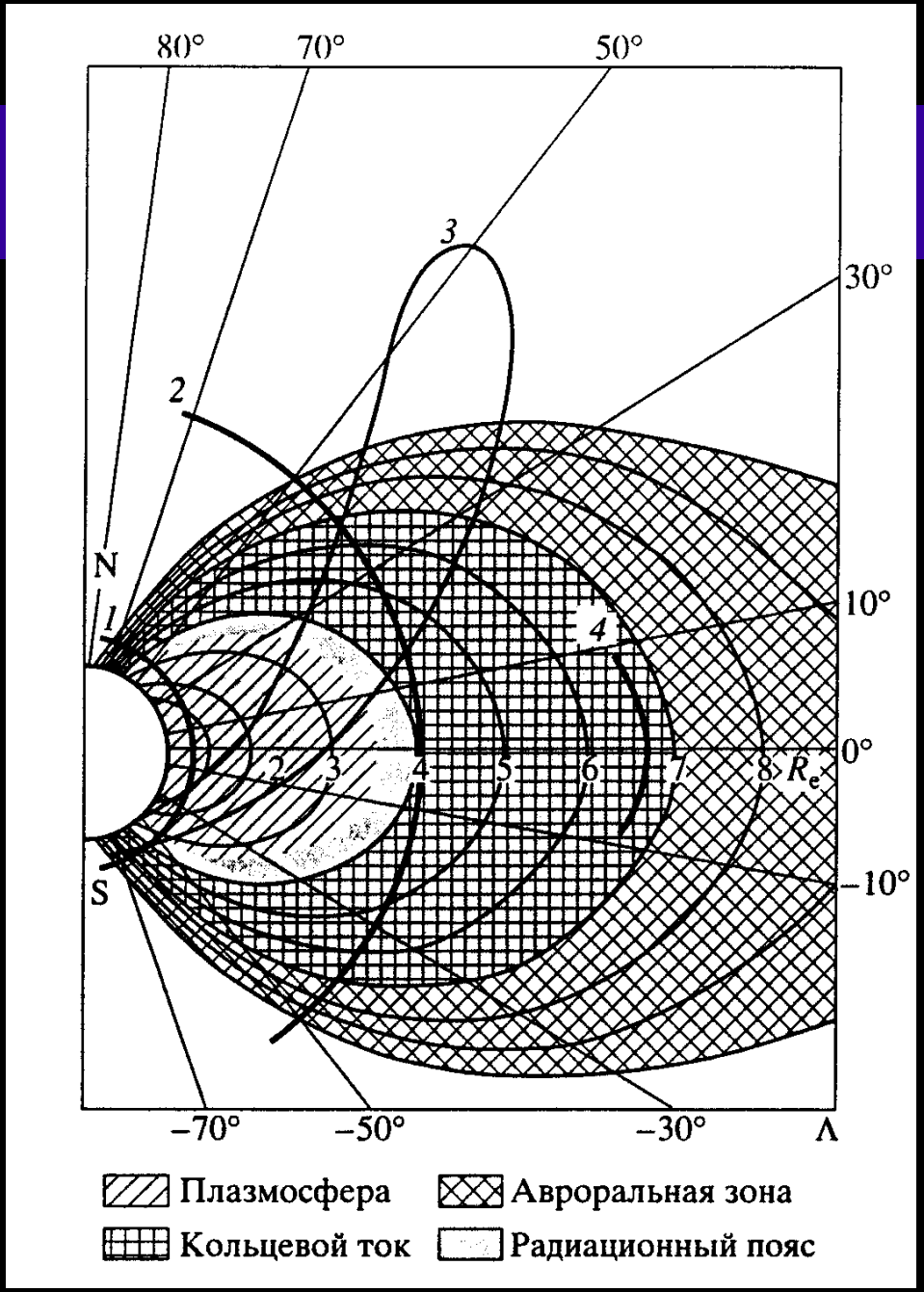
Detector Types	Energy Range
Electrostatic analyzer	Ee=1 keV
Windowed Geiger counter	Ee>40 keV Ei>1 MeV
Semiconductor Telescop	Ee=0.1-1.5 MeV Ei=12-50 keV
Scintillator and Semiconductor Telescop	Ee=2-6 MeV Ei=10-300 MeV
Cherenkov detector	Ee>5 MeV Ei>500 MeV/nucl.
Dosimeter	Ee>4MeV Ei>50 MeV

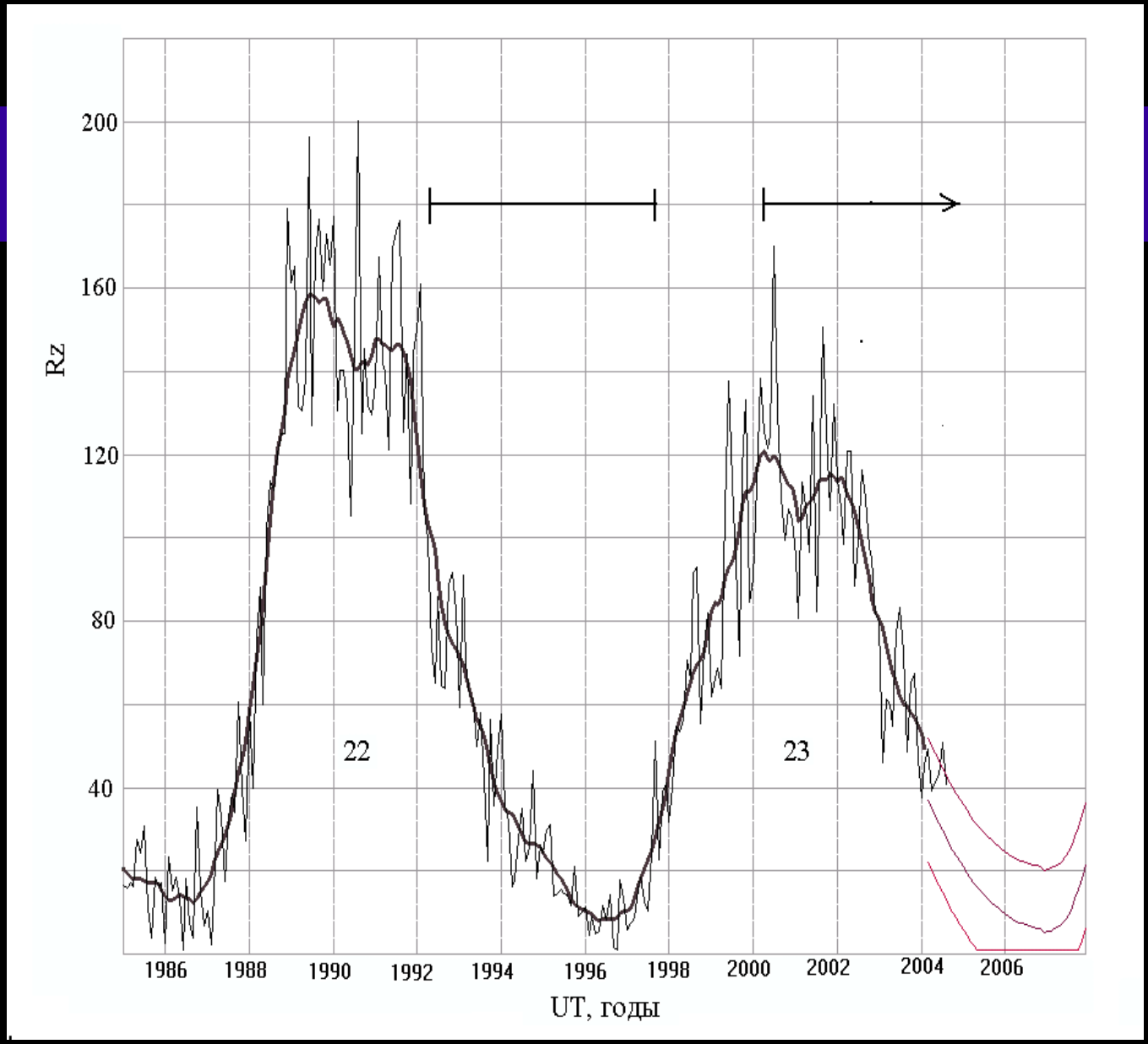
Satellite Experiments

Satellite	Orbit	Time	Solar Cycle
Gorizont-34	Geostationary, H=36 600 km	1991 – 1992	Decrease 22 SC
Gorizont-35	Geostationary, H=36 600 km	1991 – 1994	Decrease 22 SC
Gorizont-41	Geostationary, H=36 600 km	1993 – 1994	Decrease 2 2 SC
Glonass-60	Circular, H=20 000 km, i=65°	1994 – 1996	Decrease and minimum 22 SC
Electro	Geostationary, H=36 600 km	1995 - 1998	Minimum and increase 23 SC
Express-11	Geostationary H=36 600 km	1995 - 1996	Minimum 23 SC
Express-A2	Geostationary, H=36 600 km	2000 – p.t.	Maximum and decrease 23 SC
Express-A3	Geostationary, H=36 600 km	2000 – p.t.	Maximum and decrease 23 SC
Molniya-3K	Elliptical, i=62° Ha=40 000 km Hp=500 km,	2001 – p.t.	Maximum and decrease 23 SC

Satellite Orbits:

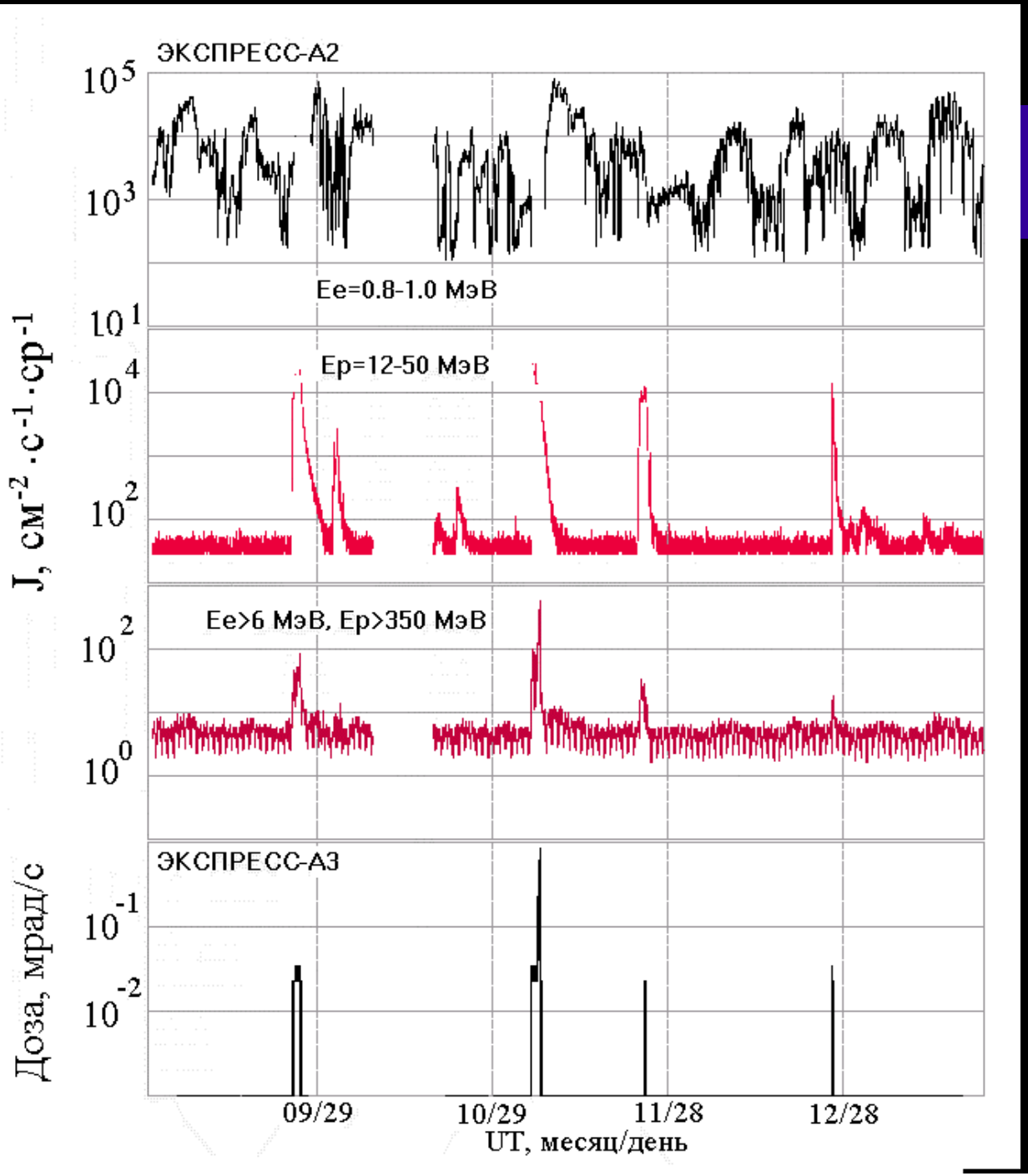
1. COSMOS
2. GLONASS
3. MOLNIYA
4. GORIZONT
   EXPRESS





Solar Cycles

Radiation Situation on Geosynchronous Orbit in 2001



Electron Flux Dynamics on Geosynchronous Orbit